Handout for US 410 — Perspectives on Studying Creativity
Spring '99
Lab Handout for Computer Models

Bruce MacLennan

Running the Simulation Program

1. Type `cubedemo` at the `UNIX>` prompt to start the program.

2. To see single updates, type the following:

   ```
   set stepsize update
   set single 1
   cycle
   ```

   Then, to see one step, hit the return key. You may hit it quickly to watch the process.

   When you are done, type `b`.

3. To return to high speed operation, type:

   ```
   set single 0
   ```

4. Each time you want to run another simulation, type:

   ```
   newstart
   cycle
   ```

   The first command reinitializes everything, the second runs the simulation for a fixed number of cycles. For convenience you can type `newstart cycle` together.

5. If you type `cycle` without `newstart` it will continue to run the previous simulation some more.

6. If you want to rerun the last simulation in slow speed, so you can see what happened, type the following:

   ```
   reset
   set single 1
   cycle
   ```

   The `reset` command sets the activities to zero, but leaves everything else the same. (You do not have to type `set stepsize update` after the first time.)

7. The `istr` parameter determines how quickly activity flows between units (or how tightly they are mutually constrained). The default value is 0.4, but you can set it by:

   ```
   set param istr 2.0
   ```

   Try values of 2.0 and 0.1. For the latter value, you will want to increase the number of cycles the simulation runs:

   ```
   set ncycles 50
   ```

   When you are done, reset the values as follows:

   ```
   set param istr 0.4
   set ncycles 20
   ```

8. To put a *bias* on a particular unit (say, Afur), type:

   cs: `input`
   Do you want to reset all inputs?: (y or n) `n`
   give unit name or number: `Afur`
   enter input strength of Afur: `1.0`
   give unit name or number: *(Return)*

   (Prompts are shown **like this**.)

9. To reset the biases type:

   cs: `input`
   Do you want to reset all inputs?: (y or n) `y`
   give unit name or number: *(Return)*

10. To run the simulation as a Boltzmann machine, type:

    ```
    set mode boltzmann 1
    set ncycles 60
    ```

11. To set an annealing schedule you can type something like this:

    ```
    get annealing 2 20 0.5 40 0.05 end
    ```

    This means to start at temperature 2, decrease by cycle 20 to temperature 0.5, decrease by cycle 40 to 0.05, and keep it at 0.05 to the end. You can also type `get annealing` and the program will prompt you for each item.

12. To quit the program, type `quit` and answer `y` to the confirmation.

13. Type `logout` to log out of Unix.

Some Activities to Try

1. Get familiar with the Necker cube demo, by running several simulations, both in single-step and fast mode. Notice how the "goodness" changes. Notice how "coalitions" may form and compete for a while.

2. Run 20 simulations in fast mode and tabulate: (A) number of times it reaches interpretation A, (B) number of times it reaches interpretation B, (A/B) number of times it reaches a mixed interpretation.

   (A)_____ (B)_____ (A/B)_____

3. The default `istr` value is 0.4. Do 20 runs each with `istr` = 2.0 and `istr = 0.1`.

   `istr` = 2.0: (A)_____ (B)_____ (A/B)_____
   `istr` = 0.1: (A)_____ (B)_____ (A/B)_____

   Explain the result. Reset `istr` to 0.4.

4. Put a bias on one or more of the units and run 20 simulations.

   (A)_____ (B)_____ (A/B)_____

   Explain the results. Reset the bias of all units to zero when you are done.

5. Put the simulator in Boltzmann mode and run it a few times (in fast and single-step mode) to get an idea of how it works.

6. Now run 20 times in fast mode and keep track of the results (A, B, A/B).

   (A)_____ (B)_____ (A/B)_____

   Explain the differences from the non-Boltzmann experiments.

7. The default annealing schedule is `2 20 0.5`; that is, start at temperature 2 and decrease to 0.5 by time 20. Try another annealing schedule (such as that shown under item 11 on page 2). Run 20 times and discuss the differences.

   Annealing schedule: _____
   (A)_____ (B)_____ (A/B)_____